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Implementing the Common Core State Standards for Mathematics: A Comparison of Current District Content in 41 States

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Abstract

Beginning in the spring of 2011 the Center for the Study of Curriculum at Michigan State University conducted a survey of school district curriculum directors/supervisors in the 41 states that had officially adopted the new Common Core State Standards for Mathematics (CCSSM). The Center's goal was to provide baseline information to inform and guide the efforts of states, local districts, and schools as each entity moves toward implementation of the newly adopted CCSSM. The challenge of implementing the world-class and demanding CCSSM is likely to vary from state to state depending, for example, on the age and quality of a state's former mathematics standards. Additional factors likely to affect CCSSM implementation include the ability of a state education agency to disseminate information and expectations about the standards to local districts, schools, and teachers.

IMPLEMENTING THE COMMON CORE STATE STANDARDS FOR MATHEMATICS: A COMPARISON OF CURRENT DISTRICT CONTENT COVERAGE IN 41 STATES

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Introduction

Beginning in the spring of 2011[1] the Center for the Study of Curriculum at Michigan State University conducted a survey of school district curriculum directors/supervisors in the 41 states that had officially adopted the new Common Core State Standards for Mathematics (CCSSM). The Center's goal was to provide baseline information to inform and guide the efforts of states, local districts, and schools as each entity moves toward implementation of the newly adopted CCSSM. The challenge of implementing the world-class and demanding CCSSM is likely to vary from state to state depending, for example, on the age and quality of a state's former mathematics standards. Additional factors likely to affect CCSSM implementation include the ability of a state education agency to disseminate information and expectations about the standards to local districts, schools, and teachers.

In the complex organization of the U.S. education system, district curriculum directors sit at a critical juncture. Whether by official mandate or expectation, the state's official mathematics standards are expected to be faithfully implemented in the classrooms of all schools in the state's districts. Curriculum Directors (CDs) typically facilitate teachers' understandings of the state's standards and their efforts to translate them into classroom instruction. Thus Curriculum Directors provide important indicators of local districts' perspectives on and understanding of standards.

A sample of 698 District Curriculum Directors in 41 states completed a survey either on the web or through a telephone interview. Samples were drawn with probabilities proportional to district size to be representative for each state. The goals of the survey were to assess current awareness of the CCSSM initiative, obtain an indication of how well acquainted CDs were with specific CCSSM topics, and to document the current state of progress of local districts' efforts to implement the CCSSM.

All of those surveyed reported that they were aware of the CCSSM. However, at the time they were surveyed, a small number were unaware that their state had adopted the CCSSM (seven percent). The vast majority of CDs reported having read the CCSSM (93 percent). Among the large majority who had read the new standards, a large proportion, 58

[1] Surveys were conducted between June 8 and December 20, 2011 by The Harrison Group under the leadership of Dr. James Taylor.

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percent, thought that they were either "somewhat" or "pretty much" the same as their state's former mathematics standards.

As standards provide a framework to guide local instructional practices, many districts have supplemental materials to further assist teachers in implementing the standards in their classrooms. For this reason we also asked CDs to indicate how different they perceived the CCSSM to be from the current practices within their district. A little more than a quarter of all CDs, 28 percent, thought that their district's current practices reflected "major" or "large" differences from the requirements reflected in the CCSSM. Nearly half, 47 percent, thought that there were only "moderate" differences.

Many consider change to be a challenge. One might expect CDs to be somewhat tepid in their support of the CCSSM given the differences they perceive between their district's current practices and the requirements of the new standards. However, an overwhelming majority of CDs, 90 percent, reported that they thought common standards were a good idea. We asked them to consider a number of frequently cited reasons for implementing the CCSSM. The most frequently endorsed reasons all pertained to the perceived benefits for students. A large percentage of CDs indicated that doing this was extremely important in order to: "provide a consistent, clear understanding of what students are expected to learn" (88 percent); "provide a high quality education to our children" (79 percent); "reflect the knowledge and skills students will need for success in college and careers" (76 percent); and "make our system fair in providing equal opportunities to all students" (73 percent). Although the most frequently endorsed reasons for implementing the Common Core all reflected a concern and focus on students, CDs anticipated a positive impact for teachers as well as students. A vast majority of CDs thought that implementing the CCSSM would have a positive impact on "student performance in general" (87 percent) and a positive impact on "professional development for all teachers" (86 percent).

Curriculum Directors reported few anticipated difficulties in implementing the CCSSM in classrooms. The most frequently identified concern had to do with a lack of assessments appropriately aligned to the standards that could provide feedback to classroom teachers (35 percent). As information about the assessments under development by PARCC and Smarter Balance become available this may change. At the time of the survey, little information about the assessments under development had been made public. One fourth of all CDs expressed concern about the lack of textbooks that supported the standards and a little fewer (22 percent) thought that a lack of mathematics knowledge among teachers might be a challenge in implementing the new standards.

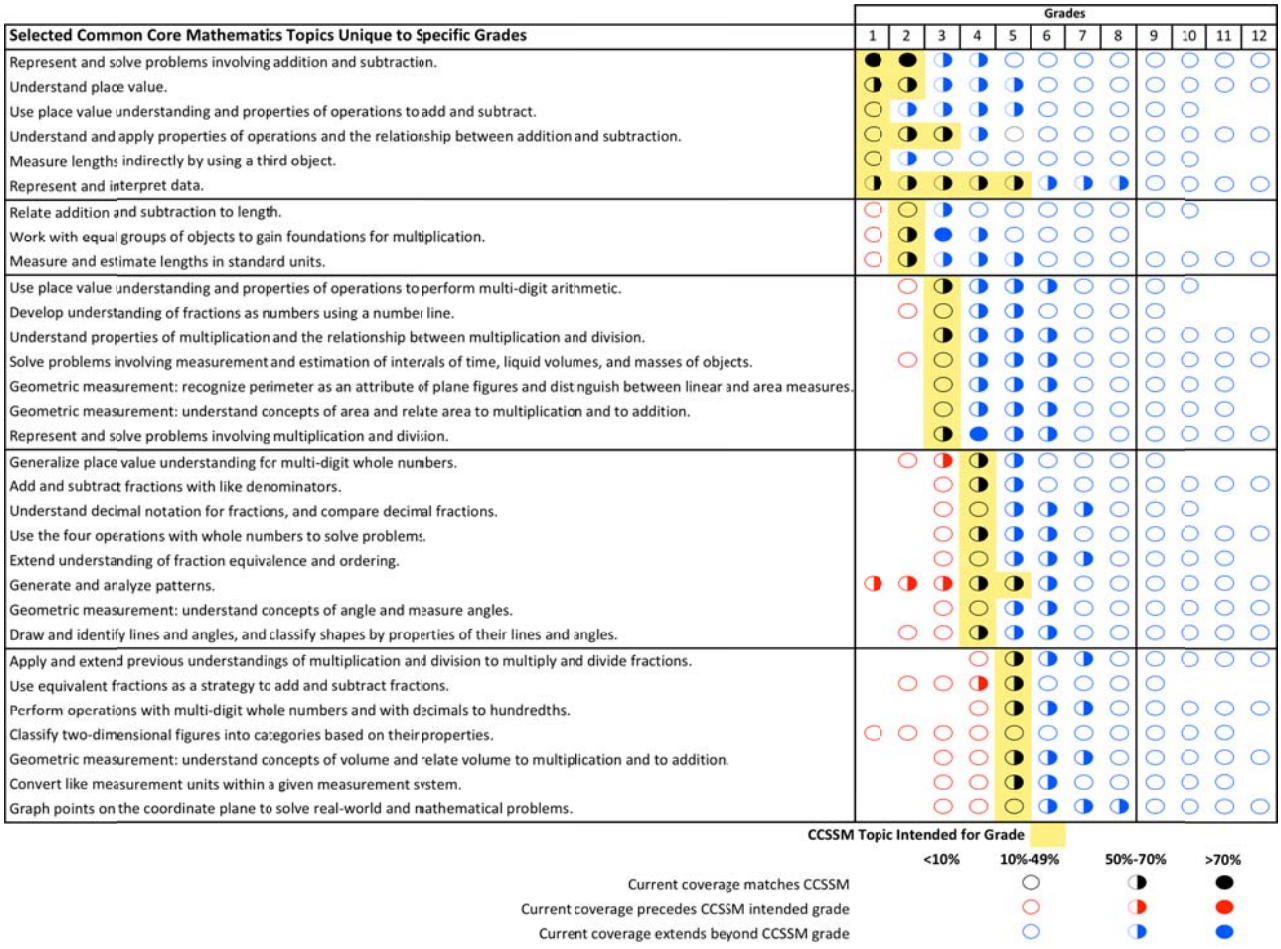
Current Practice Compared to the CCSSM

To assess the state of current practice as states and districts begin their efforts to implement the CCSSM in classrooms, we presented Curriculum Directors with 81 standards (topics to be taught) from the CCSSM and asked them to indicate at which grade or grades each were included in the taught curriculum in their district. Only a limited number of the standards (topics) were selected from each of the grades 1 to 8 as well as from those for

high school (designated as grade 9 for simplicity in displays). This procedure is similar to the curriculum topic-grade mapping that was first developed and used in the Third International Mathematics and Science Study (TIMSS) and adapted for use with districts in the U.S. (Schmidt, McKnight, Valverde, Houang, & Wiley, 1997; Schmidt et al, 2002). The topics presented to CDs were carefully selected to represent the various mathematics domains of the CCSSM at each grade. For example, for grade one: operations and algebraic thinking, number and operation in base ten, measurement and data, and geometry. As a result the portrait of current practice that this survey provides is not complete in two ways. First, it does not likely portray *everything* that is currently intended to be taught in any district. The list of 81 topics is extensive although limited and required much thought and response time from CDs. As a result only those standards/topics that served as a focal point for a grade were included. As our more recent work with districts in PROM/SE has made clear, the general findings from TIMSS that the U.S. mathematics curriculum includes many topics at every grade, yielding a curriculum that is "a mile wide and an inch deep", still holds true (page 122, Schmidt, McKnight, Raizen, 1997). The list of 81 standards/topics represents less than 20 percent of all those included in the CCSSM from grades K-12 although most of those not included are high school topics. Therefore the displays presented in this report provide a window on how these selected central CCSSM standards/topics are reflected in current practice. To the extent that current practice appears to differ little from what is specified in the CCSSM we might conclude the transition to teaching the full complement of CCSSM standards would be less difficult than would be the case where current practice appears quite different from what's specified in the CCSSM. Such inferences are based on the assumption that the selected focal CCSSM topics/standards are both representative of what is specified for each grade and that the current practice for these selected standards are representative of how the full complement of standards may be reflected in current practice.

With these caveats in mind, Displays 1-3 provide an overview of current content coverage as reported by Curriculum Directors. Display 1 contains the selected CCSSM standards for the elementary grades, grades 1-5; Display 2 has those for the middle grades, grades 6-8; and Display 3 shows current practice for the selected CCSSM high school standards. In each of the displays, the symbol represents the percentage of CDs indicating that in their district a particular topic is taught (or intended to be taught) at a specific grade. The shaded area in each display indicates the grade or grades at which they are included in the CCSSM. Note that for high school the CCSSM does not assign standards to specific grades so for the sake of the displays in this report, all CCSSM high school standards are indicated for all grades, 9-12.

Display 1. Percentage of Districts in the 41 States that Currently Intend Coverage of a Select Set of CCSSM Topics at Each of Grades 1-5.

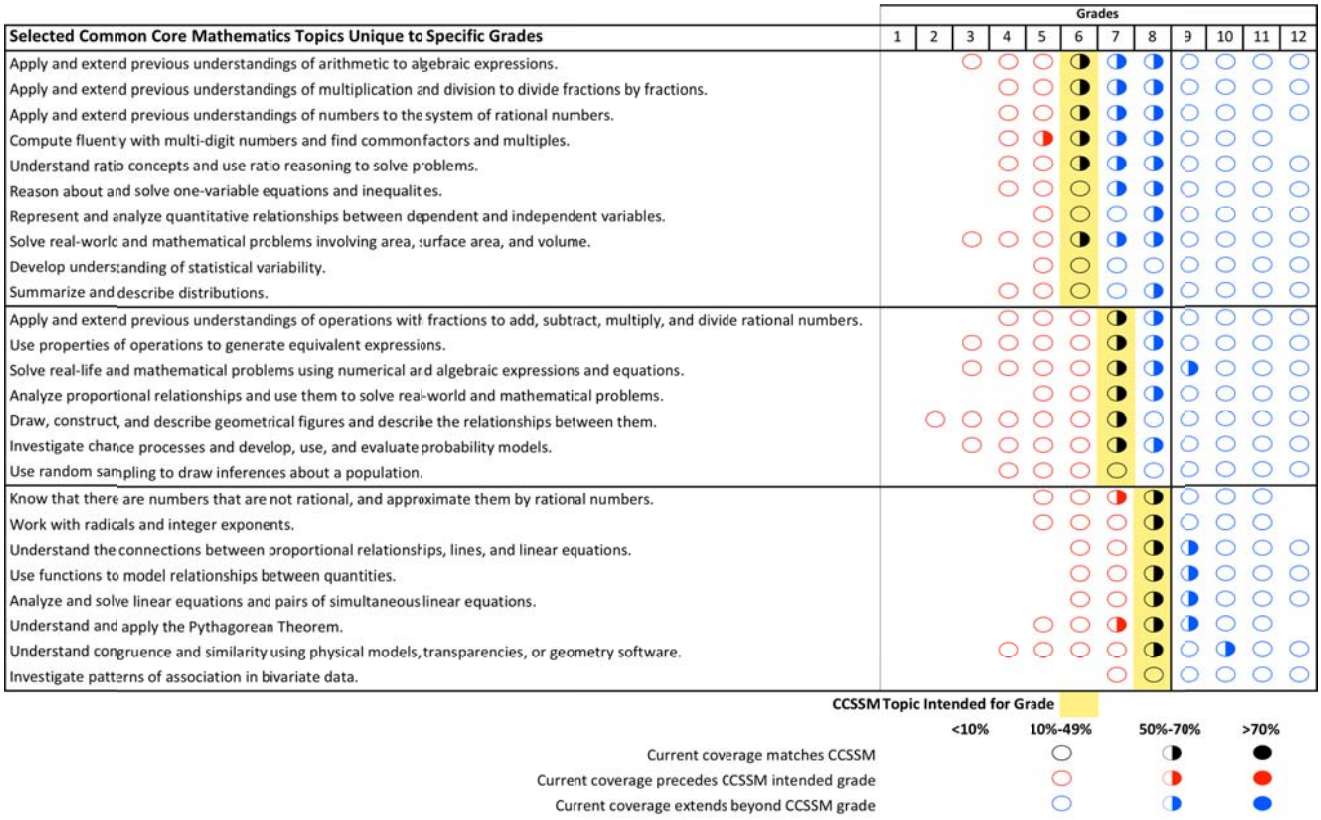


Several conclusions regarding current practice may be drawn from the display. First, there is little agreement as to the grade(s) at which each topic/standard is taught. Only two topics demonstrated agreement among more than 70 percent of the districts and then only for the first two grades. The lack of any symbol also represents agreement as the lack of any symbol signifies that the vast majority, i.e., at least 90 percent or more, agree that the topic is not taught at that grade. However, it is important to note that there are very few topics for which this is the case. The few topic-grade combinations, less than 18 percent of all those possible, that are agreed upon by the vast majority as not being taught contributes to the "mile-wide/inch-deep" characterization. The symbols for the vast majority of standard-grade combinations suggest there is great diversity in practice among the sampled districts. The fact that all of the CCSSM standard-grade specifications designated by the shaded area do not have symbols indicating the greatest degree of agreement among districts (designated by ●) suggests that the challenge in shifting to full implementation of the CCSSM is likely to vary considerably from one district to another challenging the goal that these standards be "common," that is for all children in all districts. A second conclusion is that many districts begin teaching topics/standards earlier

than envisioned in the CCSSM threatening both the focus and coherence of the CCSSM. Finally, virtually all the elementary standards are taught well past the grades specified in the CCSSM. The large percent of districts in which this is true suggests that this practice is indicative of a particular approach to teaching mathematics, i.e., cycling through topics from previous grades as well as teaching topics for the current grade. Indeed, the display well reflects the mile-wide, inch-deep characterization of the U.S. mathematics curriculum noted earlier.

To illustrate the variation both within and between states, Appendix 1 shows the results for the fourth grade topic; *Understand decimal notation for fractions, and compare decimal fractions*, for each of the 41 states.

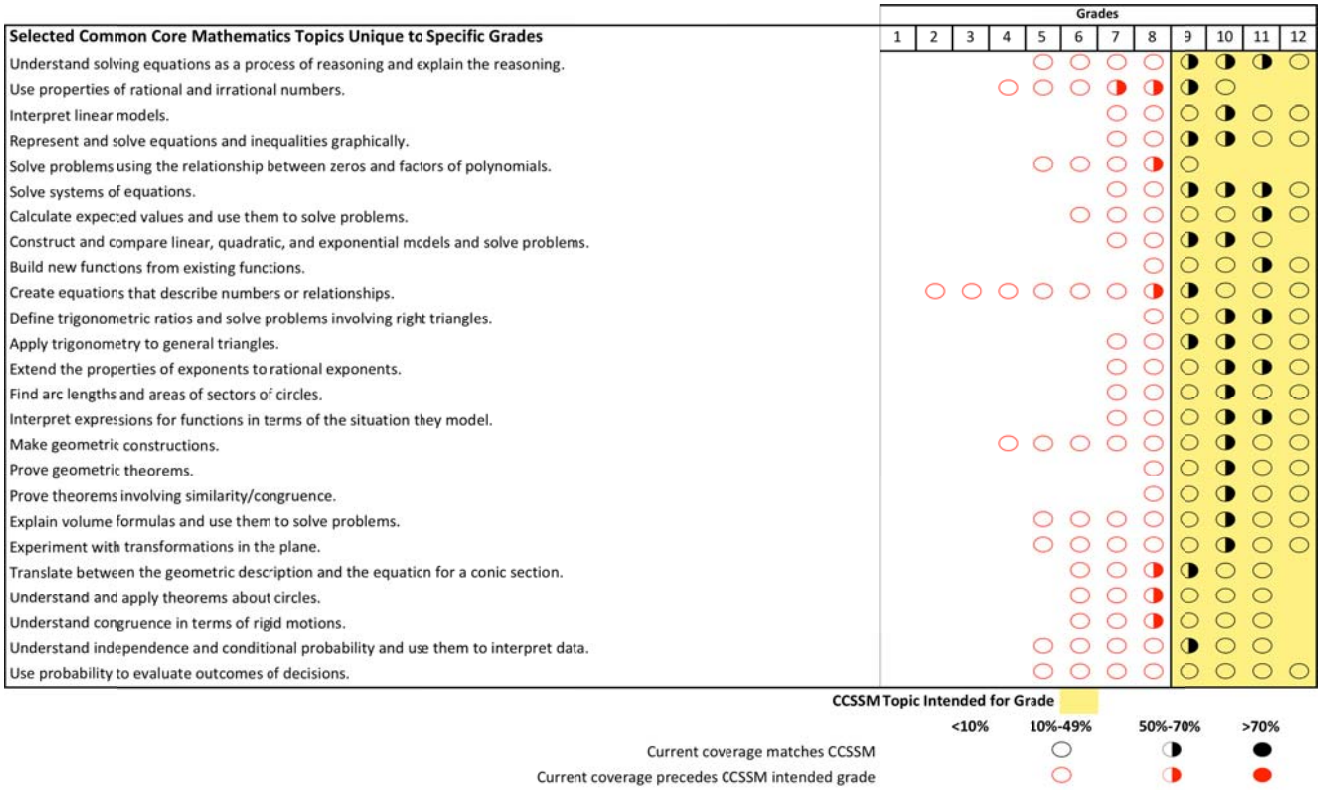
Display 2. Percentage of Districts in the 41 States that Currently Intend Coverage of a Select Set of CCSSM Topics at Each of Grades 6-8.



The good news for the middle grades, evident in Display 2, is that there appears to be more consistent agreement for those topic-grade combinations as specified in the CCSSM – as noted in the shaded area – than elsewhere. Still the agreement for teaching these standards does not reach the greatest criterion of more than 70 percent (yet alone all districts), yet for most topics the greatest agreement is found in those grades specified in the CCSSM. Nonetheless, reported practice reveals many topics being taught well before the grade specified by the CCSSM as well as persisting well after the specified grades.

To illustrate the variation both within and between states, Appendix 2 shows the results for the eighth grade topic; *Understand congruence and similarity using physical models, transparencies, or geometry software*, for each of the 41 states.

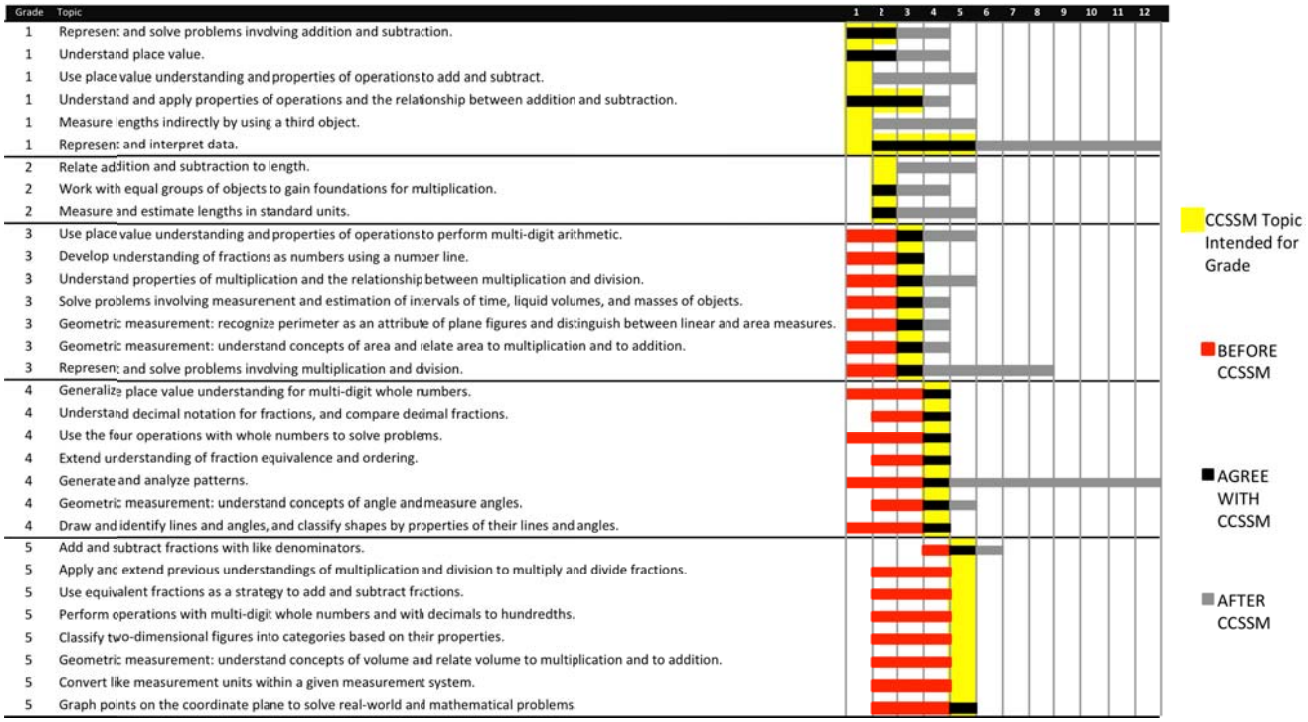
Display 3. Percentage of Districts in the 41 States that Currently Intend Coverage of a Select Set of CCSSM Topics at Each of Grades 9-12.



The high school standards (Display 3) show the most agreement among districts that these topics are currently taught at grades nine, ten, and eleven. However, the reported current practice is also prevalent at the middle grades. Because each CD indicated all the grades for which each topic/standard was taught in their district it appears that there is considerable variation from one district to another for the grades at which instruction currently begins for these high school standards again challenging the focus and coherence of the CCSSM.

To illustrate the variation both within and between states, Appendix 3 shows the results for the high school topic; *Use properties of rational and irrational numbers*, for each of the 41 states.

Display 4. The Mean Beginning Grade for Topic Coverage and the Mean Number of Grades Elementary CCSSM Topics are Taught Averaged Over the 698 Districts.



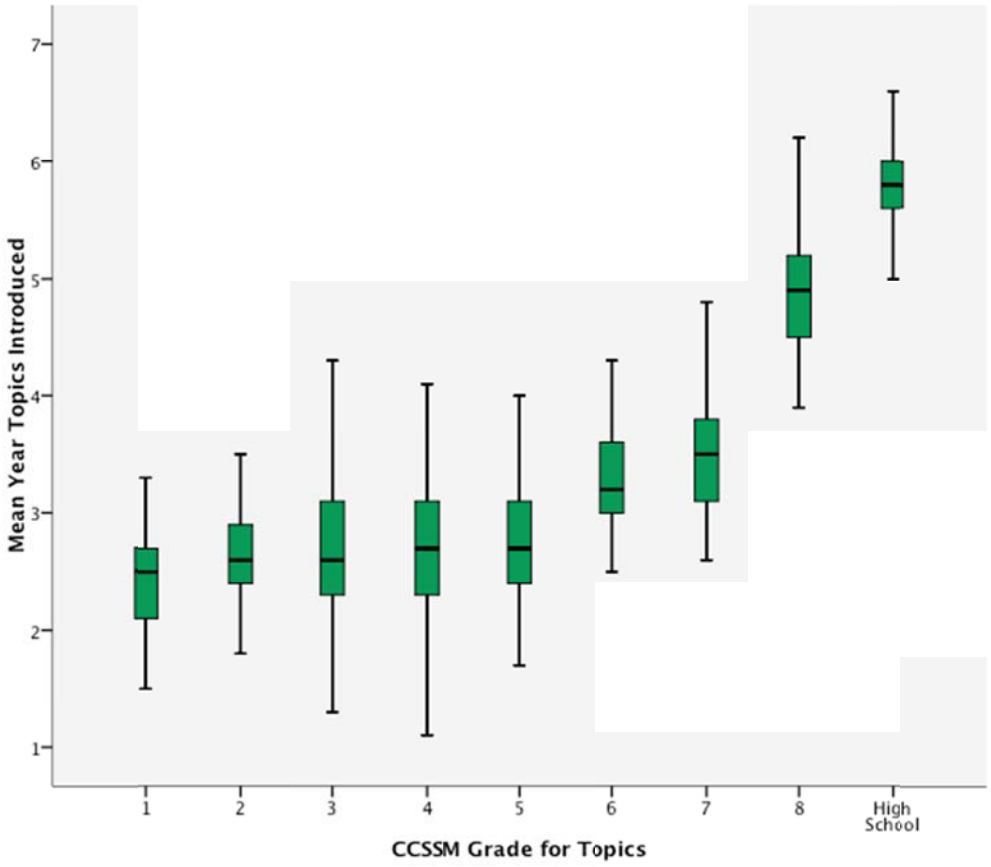
Displays 1-3 provided a summary of how all the curriculum directors responded but they did not provide any indication of what may be going on in a typical district with respect to these topics. One way to visualize current instruction in a typical district would be to examine the median grade at which CDs reported beginning instruction. In addition we can plot the median number of grades CDs reported instruction on each topic is carried out in the district. Together these two provide a sense of what instruction on these CCSSM standards looks like in a typical district as seen in Display 4 for the CCSSM elementary grade standards and Display 5 for the middle and high school standards. The horizontal bars represent the median number of grades each standard is currently taught. The bar begins at the median grade at which instruction was reported to begin. The horizontal bars are shaded to reveal whether instruction occurs before the CCSSM grade, in the same grade(s) as that in the CCSSM, or in grades later than what is specified in the CCSSM. Some topics have only a single-shaded bar; others have bars with more than one shade. The vast majority of the standards listed, however, have bars with one or two shades, indicating that *most of the typical current content coverage occurred in grades prior to the grade specified in the CCSSM*.

Display 5. The Mean Beginning Grade for Topic Coverage and the Mean Number of Grades Middle and High School CCSSM Topics are Taught Averaged Over the 698 Districts.

Displays 4 and 5 suggest what may be current practice in a typical district. Yet what is "typical" may well hide the great variation that exists in current content coverage across the many districts surveyed. Since districts reside in states and each state has its own context for mathematics standards implementation we summarized districts' current practice by state. For each CCSSM standard/topic we computed the mean grade across districts at which instruction began for each topic. We also computed for each state the

mean number of grades CDs reported that each topic was taught. Displays 6 and 7 provide a graphical summary of this variation across the states surveyed. Diversity in the grade at which instruction begins can be seen in Display 6. Variation in the number of grades for which instruction occurs for topics can be seen in Display 7. In each case these summaries were created across the CCSSM standards specified at each grade, e.g., the first grade standards, the second grade standards, the third grade standards, etc. The state means for each grade's standards are presented in a boxplot.

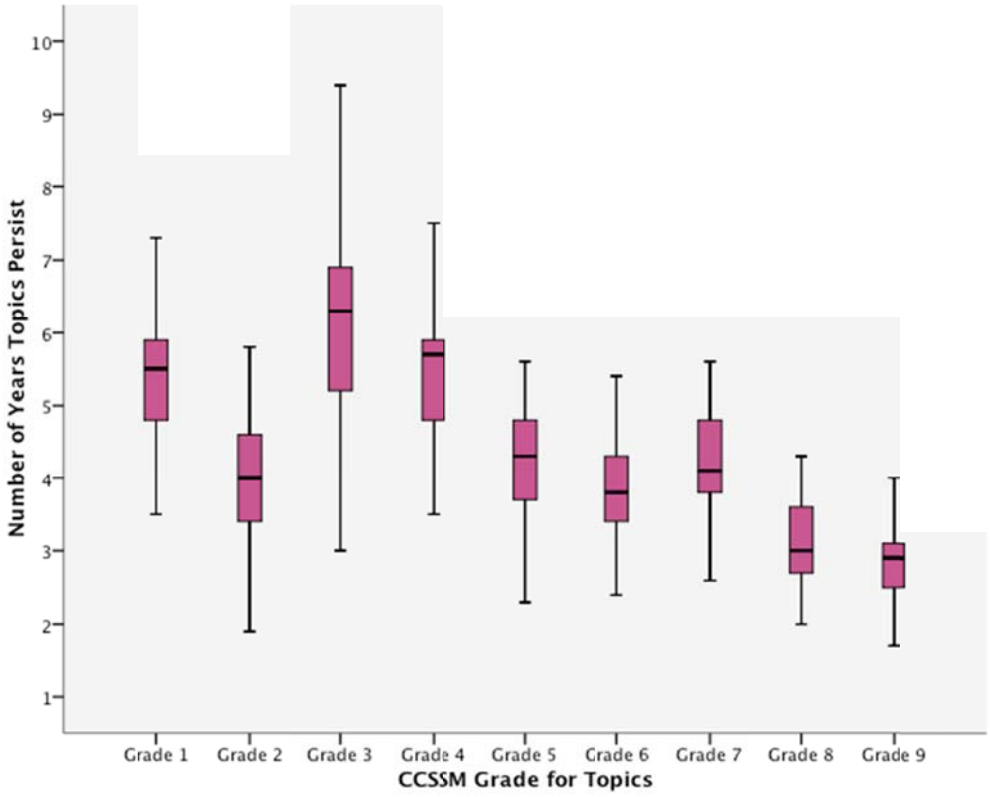
Display 6. Boxplots of Weighted State Means for Grade at which Instruction Begins for the CCSSM Grades' Standards Averaged Over the States' Districts.



If all the state means were the same, the boxplot would appear as a horizontal bar representing that value. However, this is not the case and the boxplot displays the diversity among the state means. The box represents half of the state means. More specifically, the box represents the half of the state means that are in the middle of the distribution of the means for all the states. Thus the box does not represent the largest values nor the smallest values. The line above the box represents the mean values for one-quarter of the states that have introduced the typical topic at later grades. The line below the box shows the range of mean values among the quarter of states with the earliest average grade. The desired

expectation would be that the median (the line within the box) value of the means would be at the grade at which the CCSSM call for their introduction. This is clearly not the case as in grades 1 and 2 they are typically introduced later than would be expected and for the remaining grades earlier than would be expected.

Display 7. Boxplots of Weighted State Means for the Number of Grades CCSSM Grades' Standards Averaged over the States' Districts.



Taking a closer look at the CCSSM first grade topics in Display 6, we see that the range of state means for introducing these topics was from about halfway through first grade through mid-way into grade 3. In both cases it may be that the state average for one or two of the first grade standards may have been grade 1, but that would imply that other of the first grade standards were introduced much later, perhaps as late as grade 4, grade 5, or even later. In any case, the state means across the selected CCSSM grade 1 standards spanned two grade levels, suggesting that some states began instruction on these topics one to two years earlier than others. Given that these are grade 1 CCSSM topics, the late introduction on these topics in other states seems rather problematic.

The boxplots for the second, third, and fourth grade standards were the only ones for which some of the state means accorded with the CCSSM. State means for the third grade standards demonstrated one of the largest ranges among the states, with some states beginning to teach these standards sometime during grade 1 while other states began to teach these same standards during the fourth grade. The boxplots for the CCSSM standards

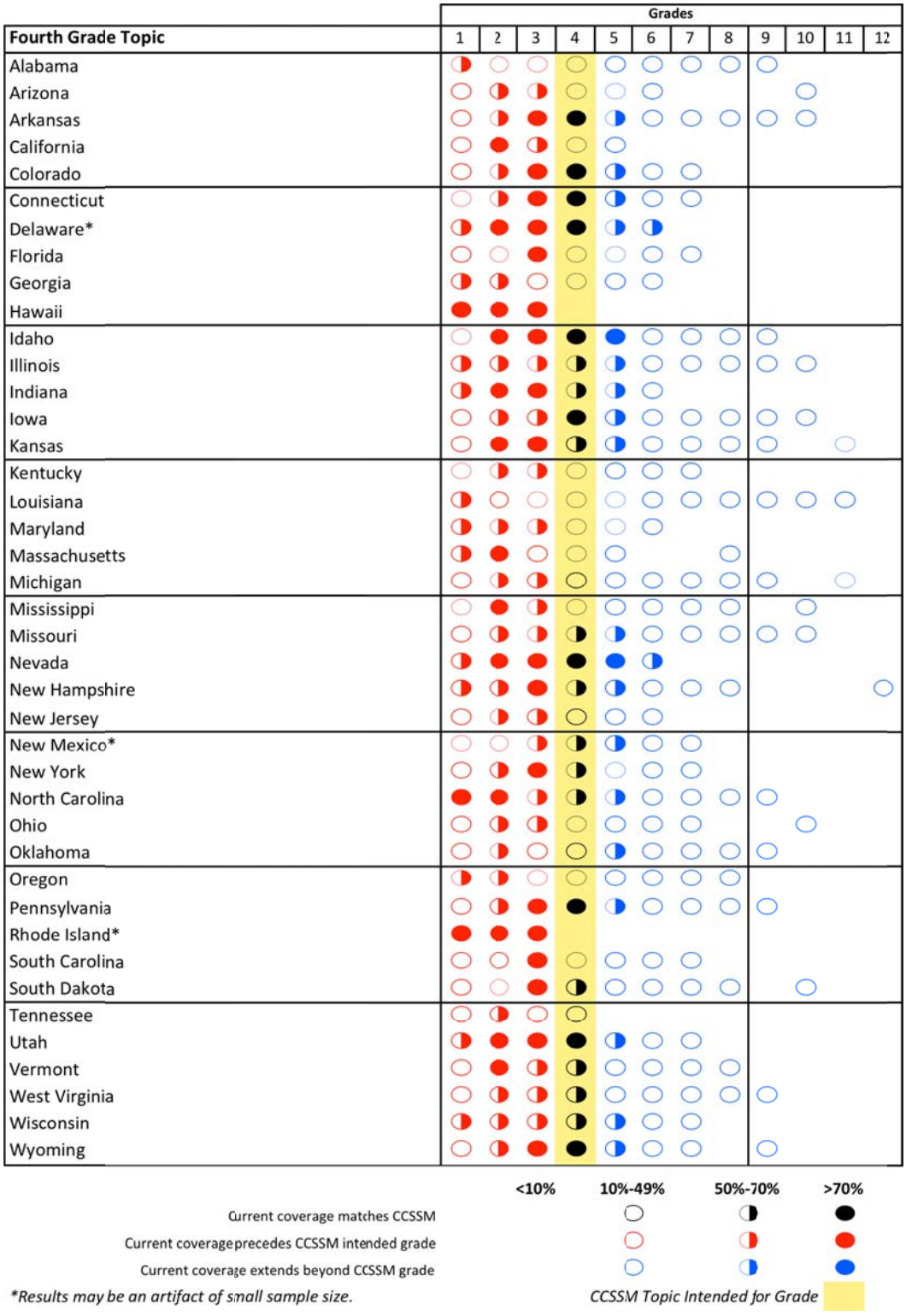
beyond grade 4 indicated that these standards were introduced anywhere from one to three years earlier than what is specified in the CCSSM. The early introduction of many of these more advanced mathematics standards raises the question as to whether the CCSSM standards have been interpreted and taught at the level of rigor conceived and presented in the CCSSM. Given the self-report of many elementary teachers that they do not feel they have the academic background to teach some of the topics intended to be taught at the grade level they teach it seems quite unlikely that they would have the required mathematics background to teach standards the CCSSM intends for grade 8 or high school (PROM/SE, 2006). Furthermore, the hierarchical nature of mathematics would suggest that these more advanced concepts addressed in the standards of grades 7, 8, and high school cannot be appropriately taught without the firm foundation of the standards in grades 4-6, many of which persist in current practice well into the middle school and high school grades (see Displays 1 and 2). All of this together raises the question whether the CCSSM standards, although read by many, have been thoroughly understood.

The story of great state variation continues in considering the length of time standards continue to be taught as can be seen in Display 7. The vast majority of CCSSM standards are unique for a particular grade, that is, there is the expectation that a standard will be introduced and taught to mastery all during a single school year. Clearly this is at odds with current practice. Without regard for the specific grade level of the standards, the typical number of years standards are taught is in the range of three to five years. This is true for the second grade through seventh grade standards.

In fact, the data presented here characterize the landscape surrounding the instruction of the CCSSM as one of enormous variation both across states and across districts within states. Furthermore the variation is also in the deviation of what is being done and what the CCSSM call for. The results do not bode well for the implementation of the CCSSM. These results challenge both the notion of “common” and of “core” which are the heart of the CCSSM.

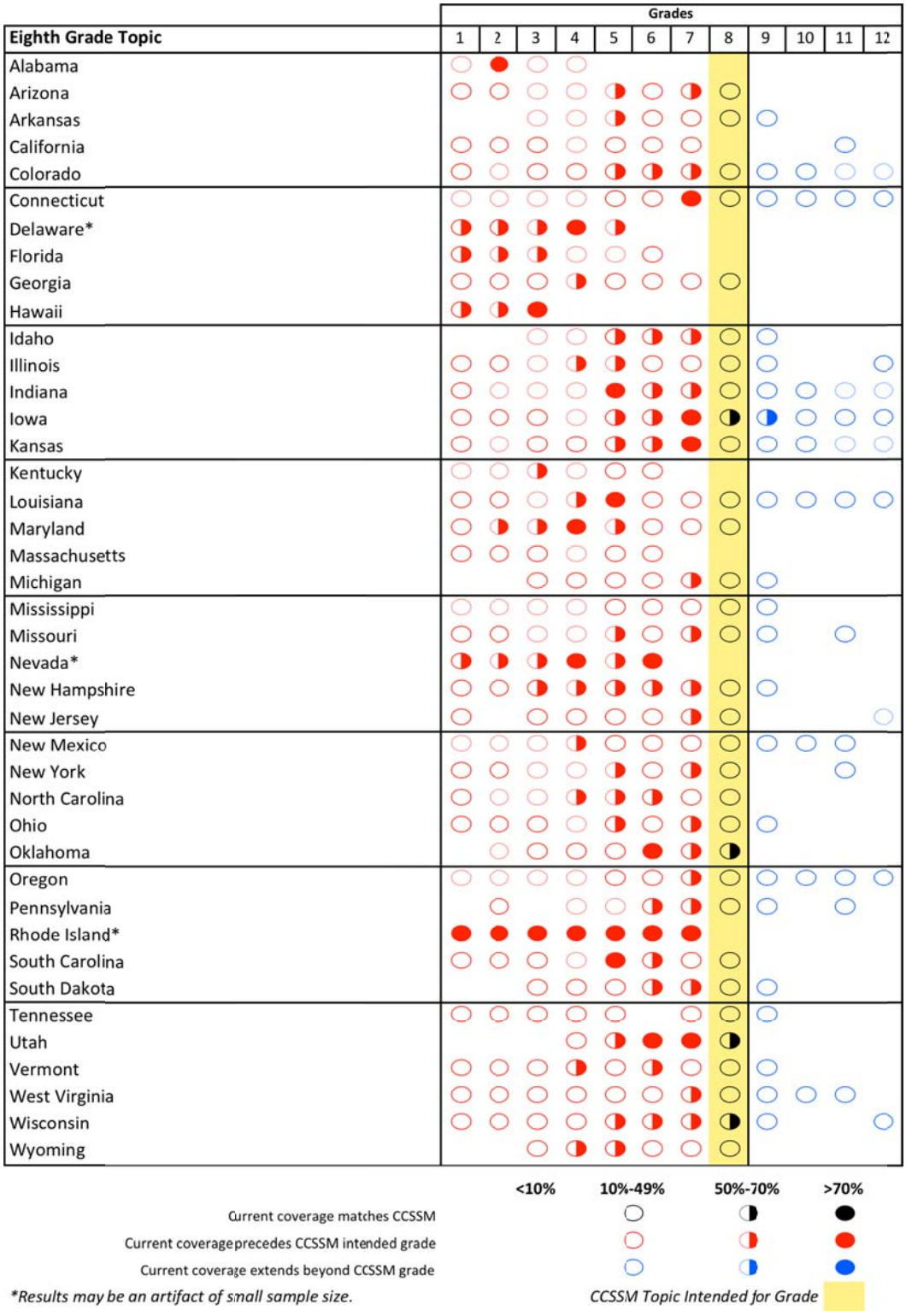
Appendix 1

Percent of Districts in the 41 States that Currently Intend Coverage of the Fourth grade topic, *Understand decimal notation for fractions, and compare decimal fractions*.



Appendix 2

Percent of Districts in the 41 States that Currently Intend Coverage of the Eighth Grade Topic, *Understand congruence and similarity using physical models, transparencies, or geometry software*.



Appendix 3

Percent of Districts in the 41 States that Currently Intend Coverage of the High School Topic, *Use properties of rational and irrational numbers*.

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